RhinoBIM®
Tools for Design through Construction

User Manual

RhinoBIM Structure

RhinoBIM Structure

Copyright ©
Version 1
01-25-2015
All Rights Reserved
Virtual Build Technologies LLC

RhinoBIM Structure is one tool in the suite of RhinoBIM products in development for architects, designers and engineers to conceptualize, refine, analyze and release structural design models built within the 3D Rhinoceros workspace.

The key implementation of RhinoBIM Structure is its capability of building large design models with a very small modeling data size. RhinoBIM Structure incorporates the use of a Light Weight Extrusion element new to Rhino V5 allowing users to build larger models than ever before.

RhinoBIM Structure program has functionality to BUILD and EDIT structural members that are selected from an extensive library of international standards and catalogs. Attached to structural members are various materials, attributes, and process treatments that are associated with the database. This is available for extracting to BIM reports for downstream applications, including structural analysis, detailing, cost analysis, scheduling, fabrication and staging.

Along with the associated libraries, RhinoBIM Structure has the ability for users to add their own cross sectional shapes into a user defined library. RhinoBIM can export and import structural libraries to coordinate with multiple users within a project.

RhinoBIM has a Clash and Clear function that can detect a hard clash or a soft clearance of a set of selected Rhino entities against another set of entities. The clearance function allows the user to specify a clearance zone offset from the selected structural members and then detect any soft clashes that occur within that zone. This function is useful for allowing a design criteria of clearance around the structural members for such treatments as fireproofing on specified members. Images in jpg format can be created for each interference issue found and stored with generated reports. With this analysis there is no need to export the geometry to another program to perform this function. As clash and clearance issues are detected within a design model, the fix can be performed within the same working model at that moment.

With RhinoBIM a project team can build a Data Set of alpha numeric information. Users can then attach the information to any Rhino entity within a model and generate reports of the Rhino entities of the attached information and the geometry it is associated with.

RhinoBIM Structure has industry standard and IFC translators available for importing and exporting structural models to other design packages as well as downstream detailing and fabrication work.

Table of Content

RhinoBIM Menu..... 3

BUILD 3
- Library..... 3
- Building Members 4
- Highlight Members 4
- Change Parameters..... 4
- Search by ID 4
- Point to Point 5
  - Chain Mode 5
- Lines 5
- Curves 5
- Surface 6
- Notes 7
- Tool Tip 8

EDIT..... 9
- Stretch..... 9
  - Drag End 9
  - To Geometry..... 9
- Rotate..... 9
  - Real Time Rotation..... 9
  - By Geometry Selection..... 10
  - Flip 10
  - Enter Angle..... 10
- Move..... 10
  - Move Node..... 10
- Trim..... 11
  - From Planer Surface..... 11
  - Plane From Three Points 11
  - Plane from Normal..... 11
  - Miter..... 11
- Curve..... 12
  - Copy Attributes..... 12

Analysis..... 13
- Clash and Clear..... 13
  - Clash and Clear Report 13
  - Incident Highlight 14
  - Viewing Report 14
  - Creating Snapshot 15
  - Exporting Report 15
- Quantity Take Off 16

Manage..... 18
- Create User Profiles 18
- Translate 20
  - BIM Reports..... 20
  - CIS/2 20
  - IFC 20
  - Convert to NURBS 22
  - User Data 22

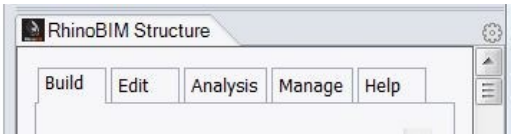
RhinoBIM Menu

Start RhinoBIM Structure by selecting the icon in the toolbar command line or by entering the command RhinoBIM_STR

RhinoBIM Structure main menu has five function tabs:

BUILD, EDIT, ANALYSIS, MANAGE and **HELP**.

Tab selection follows the design process flow to **BUILD** the structural frame, **EDIT** existing structural members to refine the model, **ANALYSIS** for detecting clashes and clearances and generate quantity take off information, **MANAGE** for adding user defined profiles, create a user defined information data base and to release the design transferring to detailing and fabrication. The **HELP** tab directs the user to manuals and information.



BUILD

BUILD function builds structural members within Rhino 3D modeling space. Select the standard library you will use – Imperial or Metric, select from the standard catalog, structural shape, size and treatment if necessary.

Library

User selects a standard

ANSI Imperial or ISO metric

Catalog:

AISC

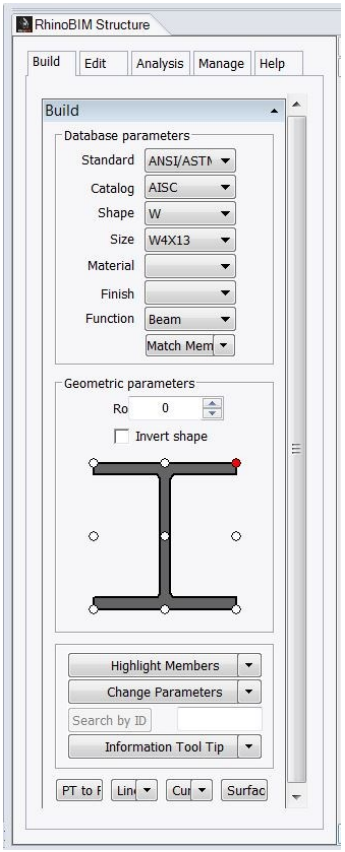
Shape:

Wide Flange	W, S, HP, M
Wide Flange Tee	WT, ST, MT
Channel	C, MC
Angles	L, 2L
Pipes	
Tubs	
Plate	

Specific size

Treatment

Or Match existing member in the model



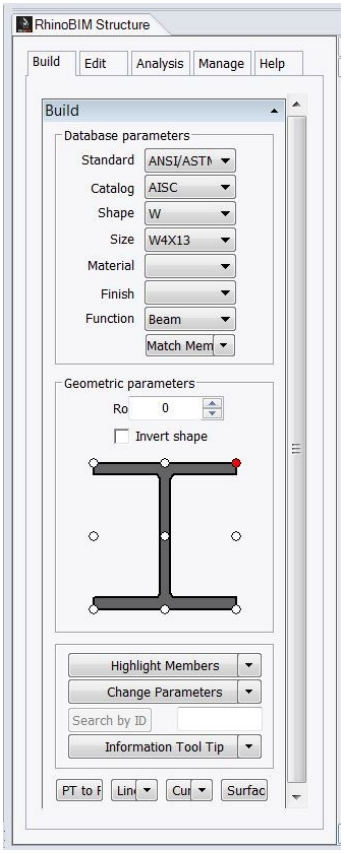
The structural members can have treatments assigned to each individual member. This information is used in BIM reports for total cost estimating.

Galvanized
Fireproof
Painted
Untreated

Add your own treatments with **Manage / Create User Profiles** function.

Highlight Members

Highlight Members function highlights all instances of the member in the model that match the selection list under the arrow at the menu's side. **All Data** would list what is in the Geometric Parameters display menu. All other selections such as, **Finish**, **Shape Parameters** and **Orientation Parameters** would Highlight only that information that is in the Geometric Parameters display menu.



Change Parameters

Change Parameters function allows you to change any parameter of any structural members in the model.

First set the new desired parameters in the **database parameters** menu. Then select the structural members in the model. After selecting the members, select the **Change Parameters** button.

Multi-selection options can be used with this function by selecting arrow next to the menu button for the options.

Search by ID

Search by ID displays the unique identifier name of the structural member and will highlight it's locate within the model.

Select a member in the model and it will display the ID name.

Enter an ID number for any known member in the menu and select the **Search by ID** button to highlight that member in the model

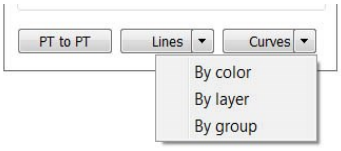
Information Tool Tip

Information Tool Tip displays all the attribute information about any structural member when the tool tip is turned on and the cursor is held over the member. This is a great function for auditing a design. Hold the tool tip over a member, if it is correct select it and then hide it.

Building Members

There are four methods for placing a structural member within the model space: **PT to PT, Lines, Curves** and **Surface**. Each function allows you to place a structural shape; from a point to point, on lines in the model, on curves in the model or on a surface oriented with its vector.

Line and curve elements within the Rhino model can be selected using standard Rhino selection methods. Another method for selecting multiple lines or curves at one time is to select the arrow within the function buttons to display multi-selection options: by color, by layer or by group.



PT to PT

Point to Point builds structural members within the model by selecting or indicating a point location for the first end of a member and a second point for the other end. Continue selecting any two points within the model space until you press Spacebar or Enter Key to end the routine.

In the command line are the following options:

Vertical mode builds vertical columns from first point selected.

Select **PT to PT** function

Select first point in the model

Select Vertical option command line

Key value for length or drag to desired length

Chain mode builds a chain of consecutive structure members from last point selected.

Select **PT to PT** function

Select first point in the model

Select (Chain) in command line or Enter **C** on keyboard to begin **Chain mode**

When finished with **Chain mode**, press Spacebar or Enter Key to return to the **PT to PT** mode

Miter builds a chain of consecutive structure members and trims the connections with miters

Lines

Lines function allows a structural member to be placed on lines within the model space.

There is no limit to the number of structural members that can be placed on lines at one time.

Select lines within the model to place structural members on

Select **Lines** button

or

Select **Lines** button first

Select lines within the model

Press Spacebar or Enter key

Curves

Curves function acts the same as **Lines** function but works only for curved members.

When selecting lines or curves in the model space, RhinoBIM Structure can detect the difference between a line, a planer curve or a non-planer curve.

If a planer curve is detected, the profile is oriented with the flanges of the structure parallel to the plane of the curve.

If a non-planer curve is detected, the program prompts to: **Pick orientation direction** of the profile. Pick in space and drag the orientation line or select an end of a line to align the profile.

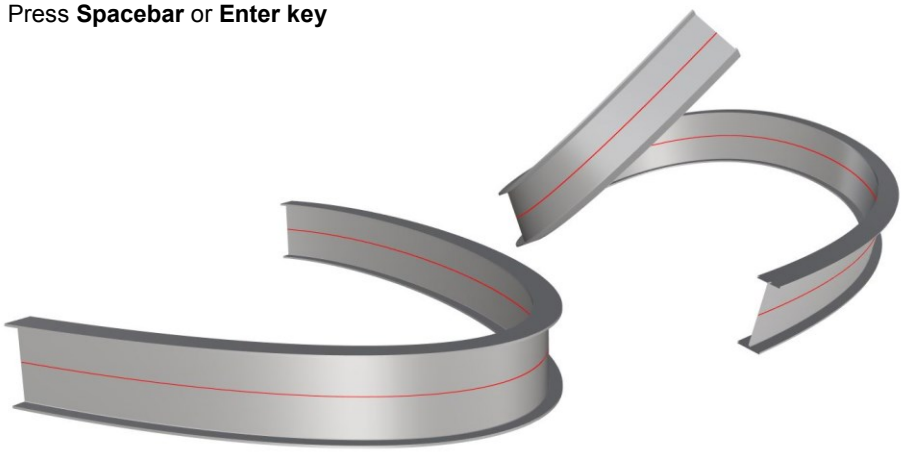
Curves function allows a structural member to be placed on multiple curves at one time. There is no limit to the number of curve selections at one time.

Select **Curves** button within the model to place structural members on

or

Select Curves within the model

Press **Spacebar** or **Enter key**



Surface

Surface function allows for placing multiple structure elements on one planar surface at one time, and orienting the structure 90 degrees to the surface. This is beneficial for placing mullions on glazing.

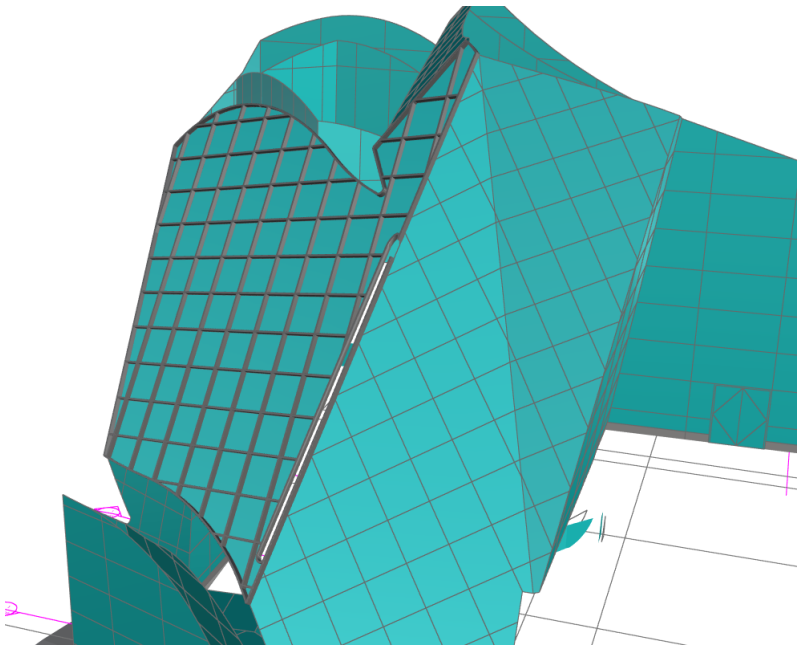
Select **Surface** button

Select the surface the structure will be placed on

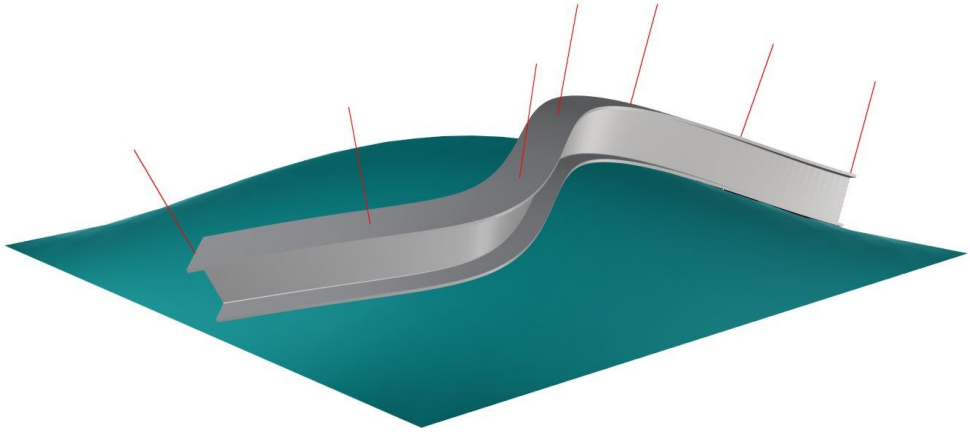
Select the curves on the surface that the structure will be built on

Press **Spacebar** of **Enter Key**

Option to flip the structure **Flip beam's normals (Yes No)**



The **Surface** function can be used to sweep a profile along a non-planar curve that lies on a compound surface. The profile orientation is controlled by the surface normals along the curve.



Select **Surface** button

Select the controlling surface

Select the curve that lies on the surface.

Press **Spacebar** of **Enter Key**

Option to flip the structure **Flip beam's normals (Yes No)**

Notes

After creating structural members with **the PT to PT, Lines** or **Curves** functions you can flip or rotate members by selecting functions in the command line.

Press Enter when done (Flip EnterAngle Rotate90 ByGeometry Gumball)

Selecting **Flip** mirrors C channels, L angles and user defined shapes about their axis

Selecting **EnterAngle** to enter a specific angle of rotation

Selecting **Rotate90** rotates the member in 90 degree increments

Selecting **ByGemoetry** selects two lines that defines the angle

Selecting **Gumball** displays an arc. Select and drag to the desired angle

The amount of rotation is displayed in lower left corner of the Rhino window.

There is a new **Osnap** developed for RhinoBIM structure members only, called **vertex**. This **Osnap** is located at the end points of structural member's hang points.

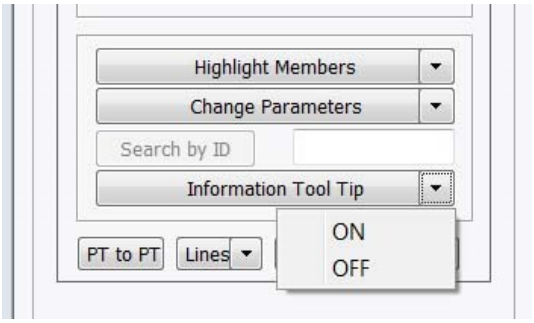
Tool Tips

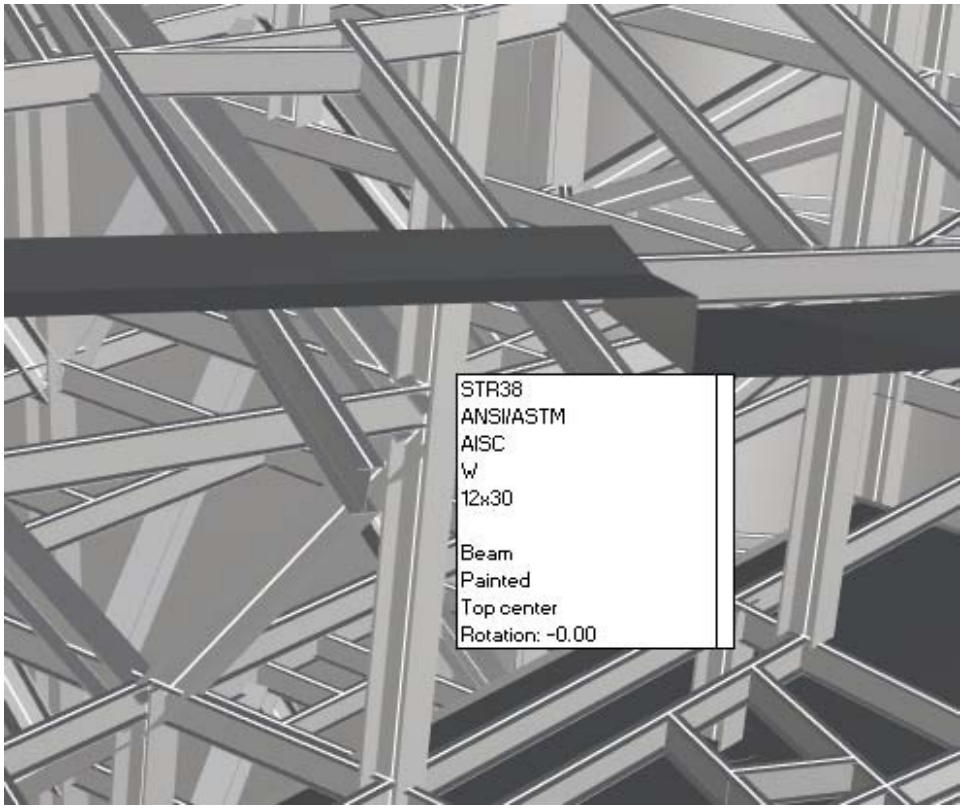
Cursor **Tool Tip** displays a window near the tip of the cursor listing the parameters of the structure member. This function helps to audit the structure model.

To turn this function on:

Select the arrow to the right of the **Information Tool Tip** button

Select ON





EDIT

EDIT tab has all functionality to make changes to structural members after they are built. Submenus within **EDIT** are **Attributes** and **Members**.

All standard Rhino transformation functions and the **Gumball** work on all RhinoBIM structural members as well.

Stretch

Drag End

Drag End can extend or retract the length of selected members. Arrow option for multi-selection can select multiple members.

Select **Drag End** button

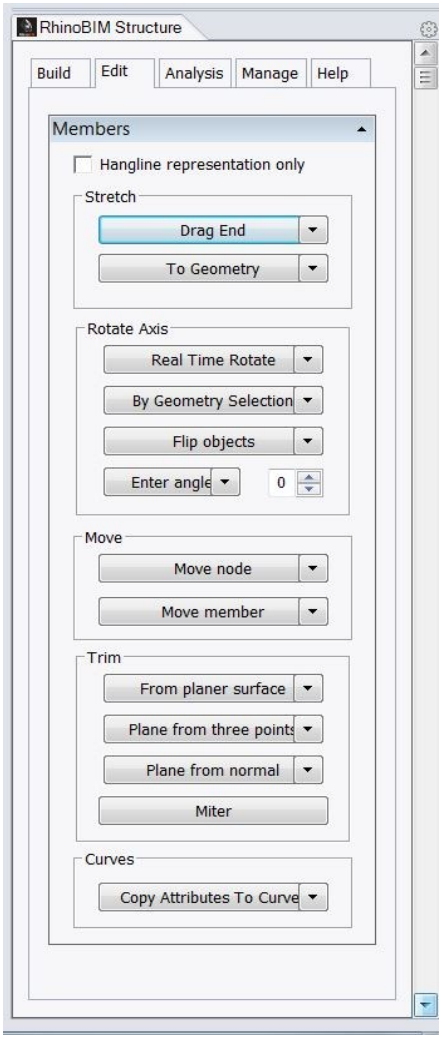
Press Spacebar or Enter Key

Pick end of members to be stretched

Use cursor to drag to desired length

Length amount is displayed in lower left corner of the Rhino window.

You may key in a specific length before dragging the cursor. Then drag the cursor to either increase or decrease the length of the member to that amount.



To Geometry

To Geometry stretches selected members to selected geometry.

Select **To Geometry** button

Press Spacebar or Enter Key

Select intersecting geometry

Rotate

Real Time Rotate

Real Time Rotate rotates selected structural members to a desired angle.

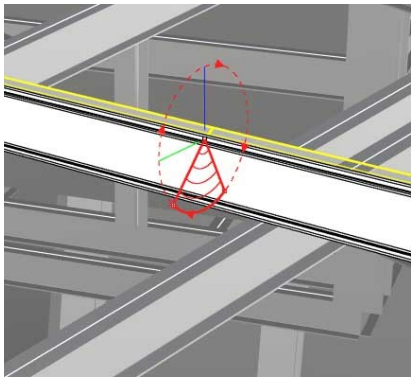
Select **Real Time Rotate** button

Select members to rotate

Press Spacebar or Enter Key

Select the arc and drag rotating member to desired angle of rotation.

The degrees of rotation is displayed in lower left corner of the Rhino window.



By Geometry Selection

By Geometry Selection rotates selected structural members to a desired angle by selecting two lines that define desired angle.

Select **By Geometry Selection** button

Select members to rotate

Press Spacebar or Enter Key

You are prompted to pick a reference object that defines the first line that describes angle

Select second line to define angle

Flip

Flip flips flanges of a member about its axis. This is used in case of C channels, L angles and user defined profiles to invert profile.

Enter Angle

Enter Angle allows you to key in a specific angle to rotate a structural member.

Key in number of degrees to rotate

Select **Enter Angle** button

Select members in model to rotate

Press Spacebar or Enter Key

Move

Move Node

Move Node moves selected node points of the structural members.

Select **Move Node** button

Select members to move

Press Spacebar or Enter Key

A popup menu gives two options: **By End Point** or **By Axis**

- **By End Point -** moves the node from one point to another point

  Pick reference point to begin move and pick point to move to.

- **By Axis –** moves the node along an axis or on a plane.

  Select one of the axis vectors or one of the plane symbols and drag the node.

  or

  Key a value in the window then select a vector or plane to drag the node.

Trim

From Planer Surface

From Planer Surface can trim selected structural members to planer surface.

Select **From Planar Surface** button

Select members to trim

Press Spacebar or Enter Key

Select a planer cutting surface

Select a point on the side of the structural member to trim away

Plane from three points

Plane from three points can trim selected structural members to three points.

Select function **Plane from Three Points**

Select members to be trimmed

Press Spacebar or Enter Key

Select three points that define the cutting plane

Select a point on the side of the structural member to trim away

Plane from Normal

Plane from normal determines a cutting plane that is normal for a line.

Select **Plane from Normal**

Select members to trim

Press Spacebar or Enter Key

Select a point

Select end point to define a line that is normal to the cutting plane

Select a point to which side of the structural member to trim away

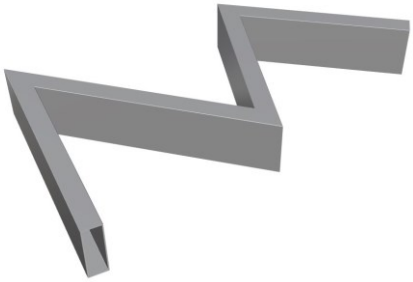
Miter

Miter miters two members to each other.

Select **Miter** button

Select end of first member to miter

Select end of second member to miter



Curve

Copy Attributes

Copy Attributes copies attributes of a curved member to a single curve or multiple curves.

Select curves to be copied to

Press **Spacebar** or **Enter key**

Select curved structural member to copy its attributes

Clash & Clear

Clash and Clear compares two sets of geometry looking for clashes and clearances between any two objects in each set. Specifying a clearance value checks where objects protrude within the defined clearance zone.

The program generates and displays a report listing hard clashes and soft clearances. Within the display window you can select an incident and ask to zoom into the selected incident and take a snapshot image of the incident.

Select objects for the first set

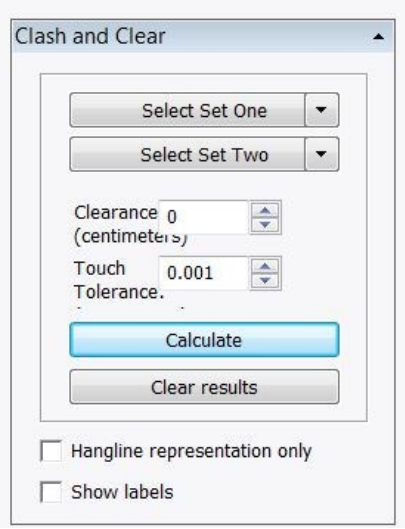
Select objects for the second set

Objects in the first selection set appear green.
Objects in the second selection set appear blue.

To check with a clearance zone enter a value

A value of 0 in the clearance checks for hard clashes only

Select Calculate button

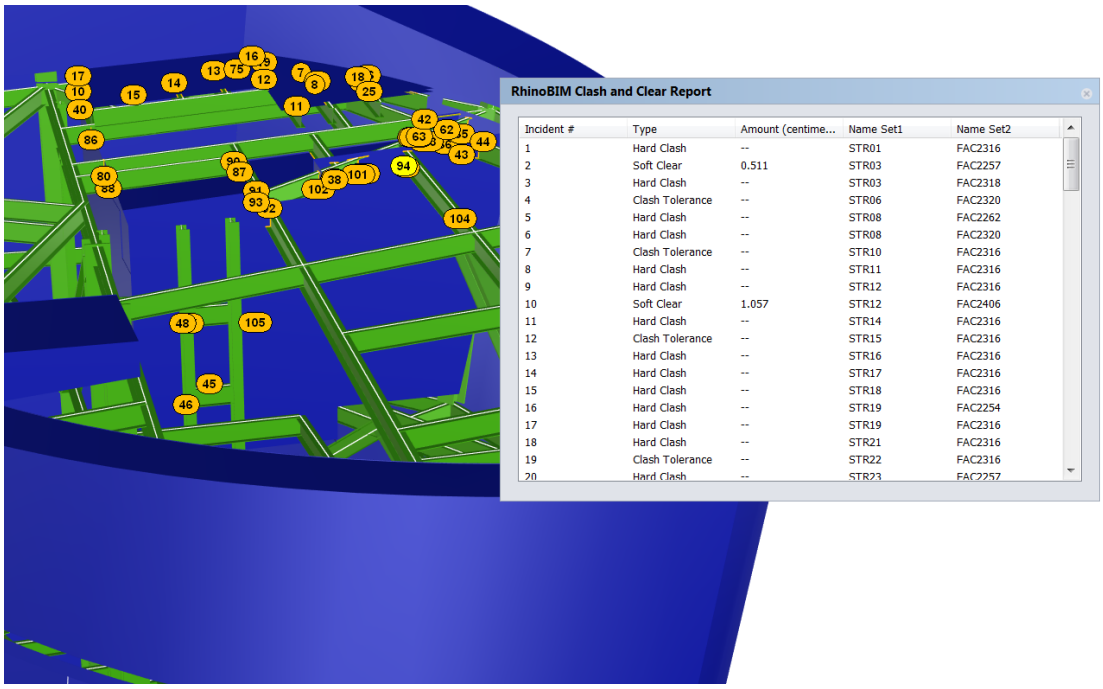


Clash & Clear Report

Once the program has completed the analysis, a window displays a report listing each incident of Hard Clash or Soft Clear.

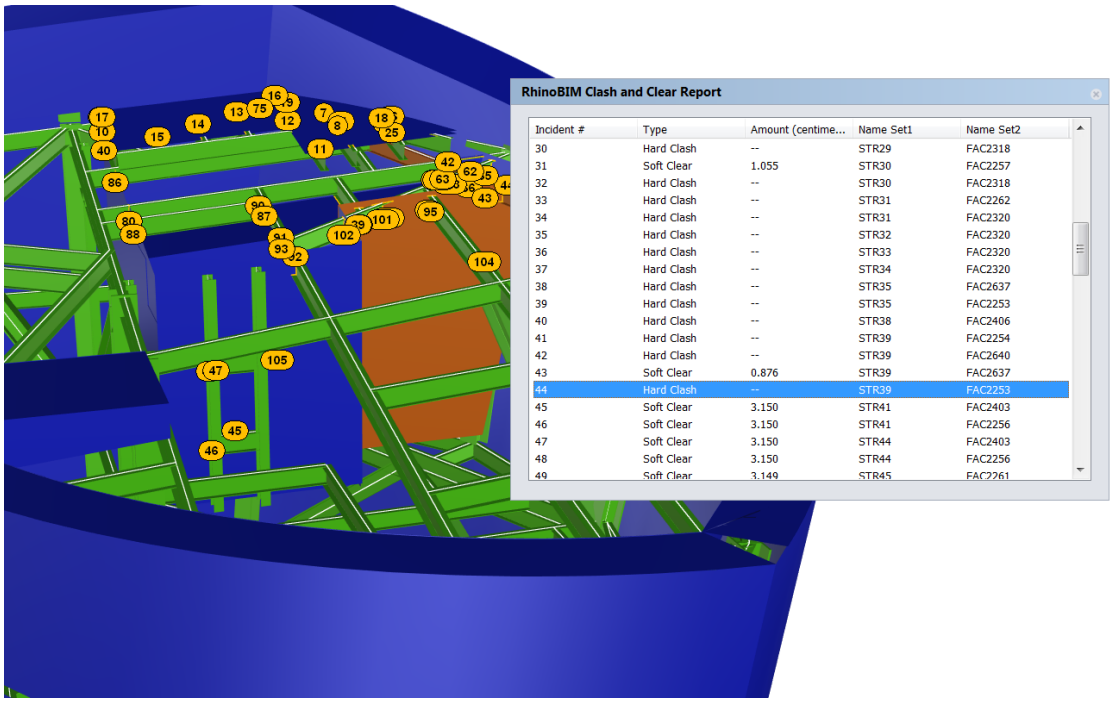
In a Soft Clear case the report lists the distance the two objects actually clear.

The report also lists the unique Identifier of the element name in each set.


RhinoBIM Clash and Clear Report
Incident # | Type | Amount (centime... | Name Set1 | Name Set2
1 | Hard Clash | -- | STR01 | FAC2316
2 | Soft Clear | 0.511 | STR03 | FAC2257
3 | Hard Clash | -- | STR03 | FAC2318
4 | Clash Tolerance | -- | STR06 | FAC2320
5 | Hard Clash | -- | STR08 | FAC2262
6 | Hard Clash | -- | STR08 | FAC2320
7 | Clash Tolerance | -- | STR10 | FAC2316
8 | Hard Clash | -- | STR11 | FAC2316
9 | Hard Clash | -- | STR12 | FAC2316
10 | Soft Clear | 1.057 | STR12 | FAC2406
11 | Hard Clash | -- | STR14 | FAC2316
12 | Clash Tolerance | -- | STR15 | FAC2316
13 | Hard Clash | -- | STR16 | FAC2316
14 | Hard Clash | -- | STR17 | FAC2316
15 | Hard Clash | -- | STR18 | FAC2316
16 | Hard Clash | -- | STR19 | FAC2254
17 | Hard Clash | -- | STR19 | FAC2316
18 | Hard Clash | -- | STR21 | FAC2316
19 | Clash Tolerance | -- | STR22 | FAC2316
20 | Hard Clash | -- | STR23 | FAC2257

Incident Highlight

Selecting an incident number will highlight the elements involved.

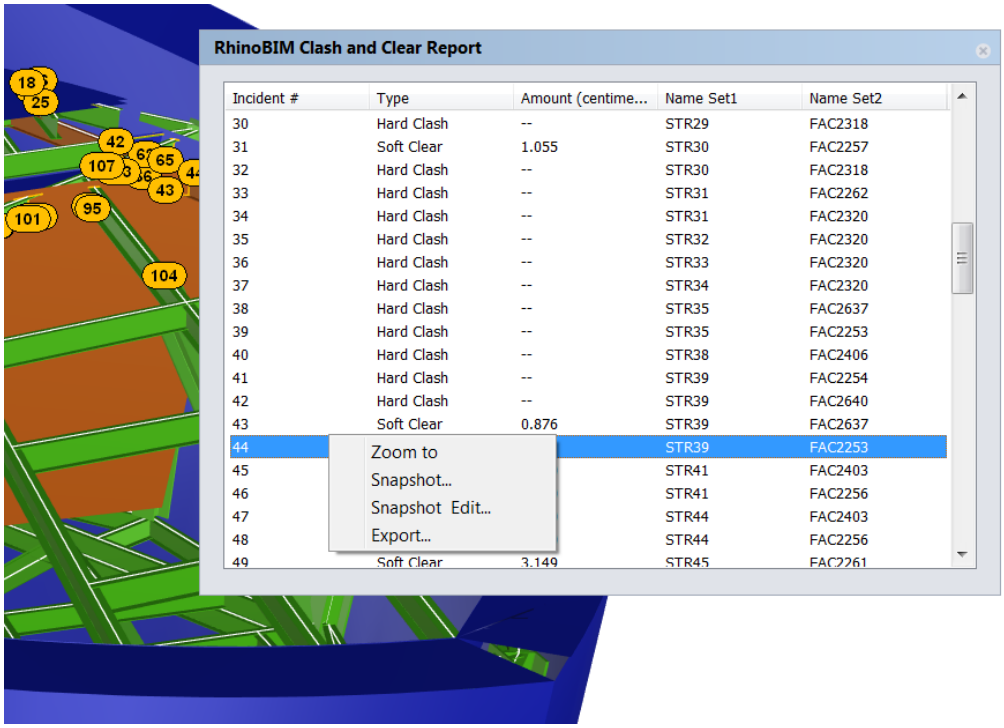

RhinoBIM Clash and Clear Report
Incident # | Type | Amount (centime... | Name Set1 | Name Set2
30 | Hard Clash | -- | STR29 | FAC2318
31 | Soft Clear | 1.055 | STR30 | FAC2257
32 | Hard Clash | -- | STR30 | FAC2318
33 | Hard Clash | -- | STR31 | FAC2262
34 | Hard Clash | -- | STR31 | FAC2320
35 | Hard Clash | -- | STR32 | FAC2320
36 | Hard Clash | -- | STR33 | FAC2320
37 | Hard Clash | -- | STR34 | FAC2320
38 | Hard Clash | -- | STR35 | FAC2637
39 | Hard Clash | -- | STR35 | FAC2253
40 | Hard Clash | -- | STR38 | FAC2406
41 | Hard Clash | -- | STR39 | FAC2254
42 | Hard Clash | -- | STR39 | FAC2640
43 | Soft Clear | 0.876 | STR39 | FAC2637
44 | Hard Clash | -- | STR39 | FAC2253
45 | Soft Clear | 3.150 | STR41 | FAC2403
46 | Soft Clear | 3.150 | STR41 | FAC2256
47 | Soft Clear | 3.150 | STR44 | FAC2403
48 | Soft Clear | 3.150 | STR44 | FAC2256

Viewing Reports

Zoom into the location of the model where the incident occurs and save a snap shot image.

Right click incident number in the menu

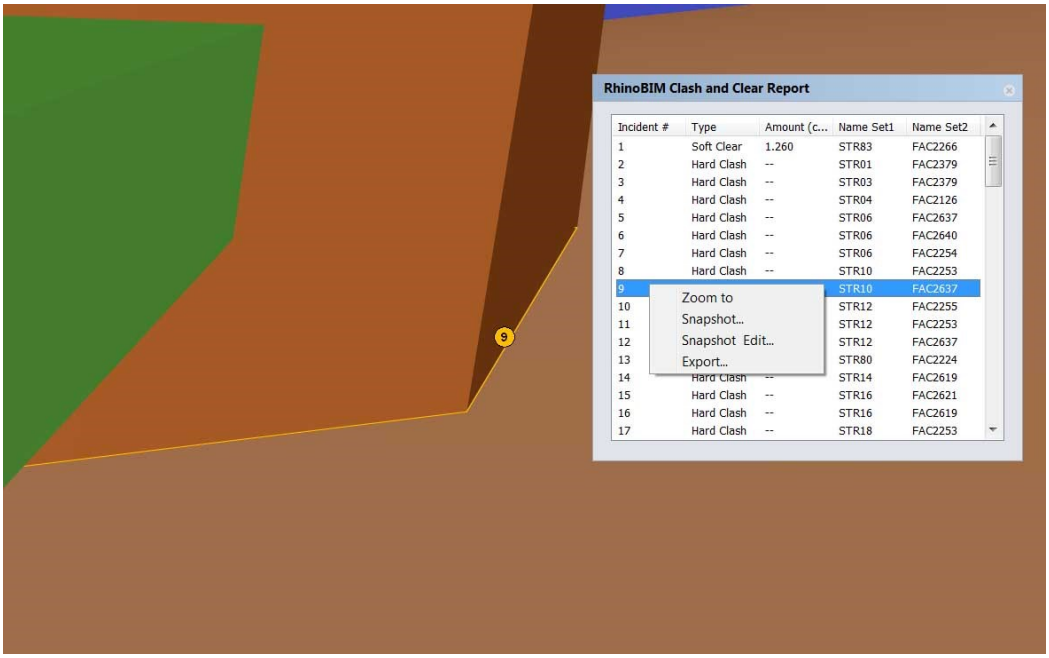
Select **Zoom to**


RhinoBIM Clash and Clear Report
Incident # | Type | Amount (centime... | Name Set1 | Name Set2
30 | Hard Clash | -- | STR29 | FAC2318
31 | Soft Clear | 1.055 | STR30 | FAC2257
32 | Hard Clash | -- | STR30 | FAC2318
33 | Hard Clash | -- | STR31 | FAC2262
34 | Hard Clash | -- | STR31 | FAC2320
35 | Hard Clash | -- | STR32 | FAC2320
36 | Hard Clash | -- | STR33 | FAC2320
37 | Hard Clash | -- | STR34 | FAC2320
38 | Hard Clash | -- | STR35 | FAC2637
39 | Hard Clash | -- | STR35 | FAC2253
40 | Hard Clash | -- | STR38 | FAC2406
41 | Hard Clash | -- | STR39 | FAC2254
42 | Hard Clash | -- | STR39 | FAC2640
43 | Soft Clear | 0.876 | STR39 | FAC2637
44 | | | STR39 | FAC2253
45 | | | STR41 | FAC2403
46 | | | STR41 | FAC2256
47 | | | STR44 | FAC2403
48 | | | STR44 | FAC2256
49 | Soft Clear | 3.149 | STR45 | FAC2261
Zoom to
Snapshot...
Snapshot Edit...
Export...

Creating Snapshot

Rotate view for better image.

Right Click Select **Snapshot**

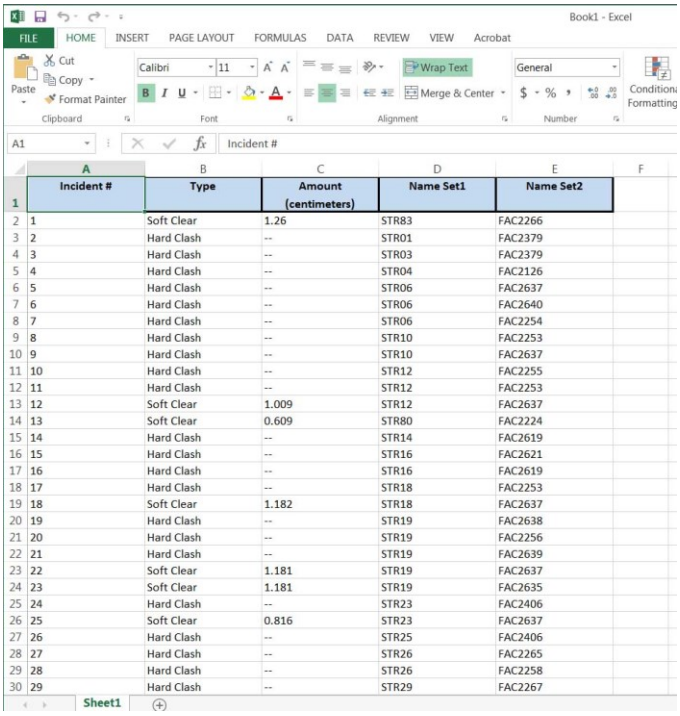

RhinoBIM Clash and Clear Report
Incident # Type Amount (c... Name Set1 Name Set2
1 Soft Clear 1.260 STR83 FAC2266
2 Hard Clash -- STR01 FAC2379
3 Hard Clash -- STR03 FAC2379
4 Hard Clash -- STR04 FAC2126
5 Hard Clash -- STR06 FAC2637
6 Hard Clash -- STR06 FAC2640
7 Hard Clash -- STR06 FAC2254
8 Hard Clash -- STR10 FAC2253
9 STR10 FAC2637
10 STR12 FAC2255
11 STR12 FAC2253
12 STR12 FAC2637
13 STR80 FAC2224
14 STR14 FAC2619
15 Hard Clash -- STR16 FAC2621
16 Hard Clash -- STR16 FAC2619
17 Hard Clash -- STR18 FAC2253
Zoom to
Snapshot...
Snapshot Edit...
Export...
9

To easily identify the saved images the name of the image defaults to the ***incident number***, if it's a ***Hard Crash*** or ***Soft Clear***, the ***amount of clearance*** and ***Unique Identifier*** name of the two objects.

For example 14 Soft Clear 1.01 11 17.jpg

Exporting Reports

Selecting **Export** will create an excel spread sheet of the entire report

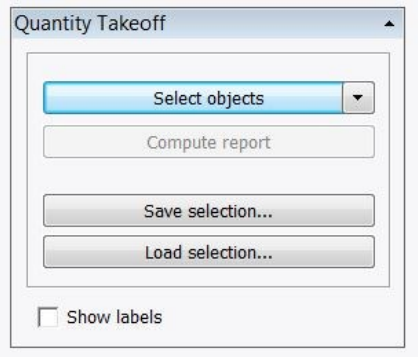


Book1 - Excel

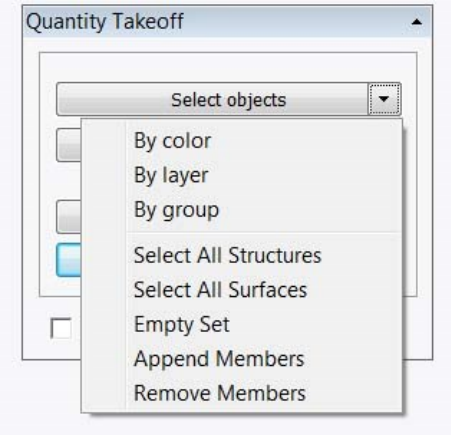
Incident #	Type	Amount (centimeters)	Name Set1	Name Set2
1	Soft Clear	1.26	STR83	FAC2266
2	Hard Clash	--	STR01	FAC2379
3	Hard Clash	--	STR03	FAC2379
4	Hard Clash	--	STR04	FAC2126
5	Hard Clash	--	STR06	FAC2637
6	Hard Clash	--	STR06	FAC2640
7	Hard Clash	--	STR06	FAC2254
8	Hard Clash	--	STR10	FAC2253
9	Hard Clash	--	STR10	FAC2637
10	Hard Clash	--	STR12	FAC2255
11	Hard Clash	--	STR12	FAC2253
12	Soft Clear	1.009	STR12	FAC2637
13	Soft Clear	0.609	STR80	FAC2224
14	Hard Clash	--	STR14	FAC2619
15	Hard Clash	--	STR16	FAC2621
16	Hard Clash	--	STR16	FAC2619
17	Hard Clash	--	STR18	FAC2253
18	Soft Clear	1.182	STR18	FAC2637
19	Hard Clash	--	STR19	FAC2638
20	Hard Clash	--	STR19	FAC2256
21	Hard Clash	--	STR19	FAC2639
22	Soft Clear	1.181	STR19	FAC2637
23	Soft Clear	1.181	STR19	FAC2635
24	Hard Clash	--	STR23	FAC2406
25	Soft Clear	0.816	STR23	FAC2637
26	Hard Clash	--	STR25	FAC2406
27	Hard Clash	--	STR26	FAC2265
28	Hard Clash	--	STR26	FAC2258
29	Hard Clash	--	STR29	FAC2267

Quantity Take offs

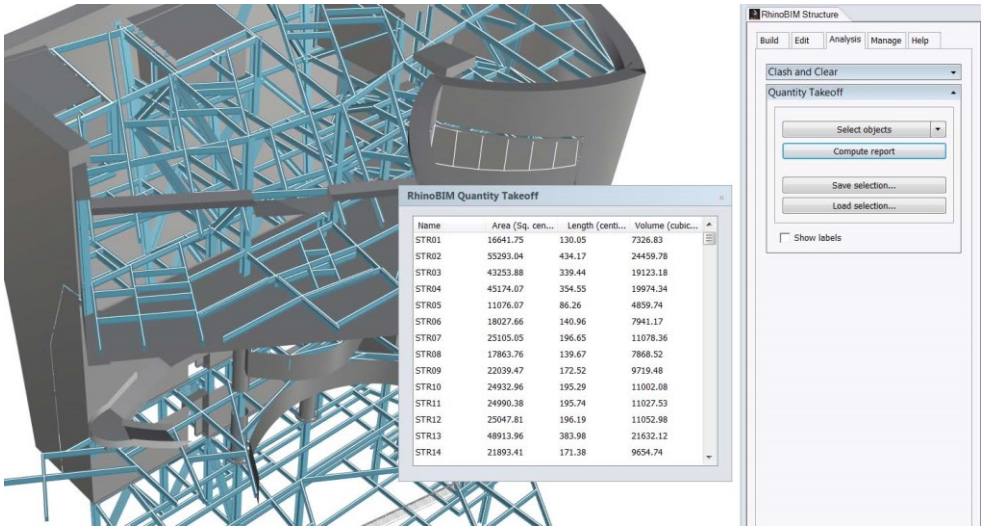
Quantity Take Off is found under the **Analysis** tab. This function creates a report listing the length, surface area, volume and weight of structural objects or surface objects selected. Each selection creates a set that can be saved and then loaded back in RhinoBIM and have new structural members appended to the set to generate a report.



Click the **Select Object** button or select the right arrow for the pull down menu for other selection options.

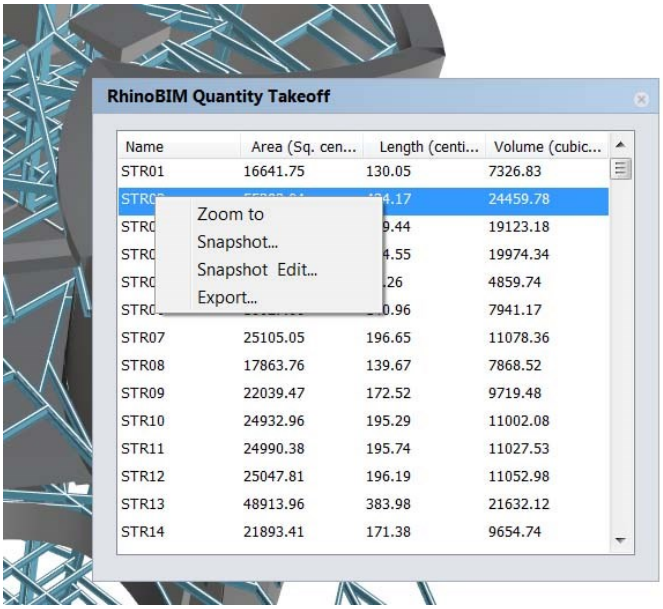


Press the **Return** button or **Spacebar** to accept the selection. Select the **Complete Report** button to compute the report.



Select a member listed in the report and press the right mouse button. This will bring up a pop up menu that allows to **Zoom** to that member and then take a **Snapshot** jpg image.

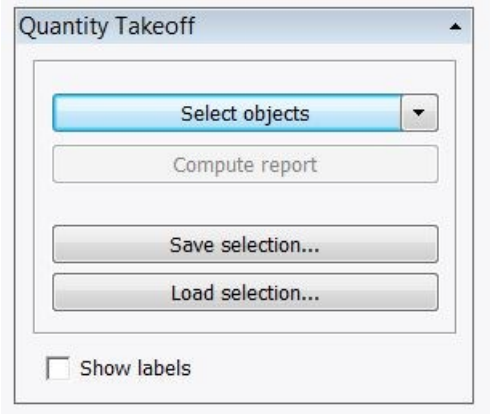
Select **Export** to save an xml spread sheet.



Select **Export** to save an excel spread sheet

Name	Material	Finish	Shape Size	Length (Sq. centimeters)	Area (centimeters)	Volume	Weight
STR174	AISC	Painted	W12x33	43404.65	340.63	19190.01	19190.01
STR328	AISC	Painted	W14x22	49953.8	392.16	22093.05	22093.05
STR189	AISC	Painted	W14x22	38713.34	303.72	17110.5	17110.5
			Total:	132071.79	1036.51	58393.56	58393.56

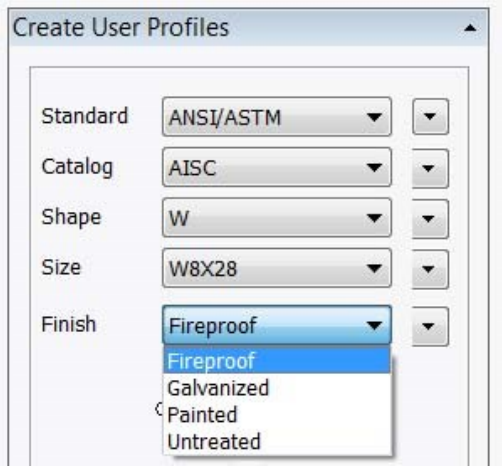
The **Save selection** button is also found in the main menu. Selecting the Load selection loads previously saved report sets.



Create User Profiles

Create User Profiles function creates new profile shapes within a library. You can create new Standards, Catalogs, Shapes, Sizes and Treatments. You can also delete any items.

Each item (Standard, Catalog, Shape, Size, Finish) has the option to create a new or delete.



To change the name of an item

Select the arrow to the right of the named button

Select the name to edit

Key in a new name in the command line

To **Create** a new item

Select the far right arrow next to the named button and select **Create**

Key the name of the new item

To **Delete** an existing item

Select the arrow to the far right of the named button

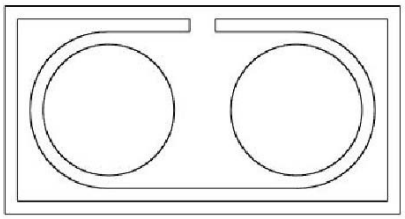
Select the name to be deleted

Select the far right arrow and select **Delete**

Select Yes in the pop up window

Creating a custom user profile.

Create the custom profile geometry in the Rhino modeling space.



Select the far right arrow next to the **Size** button and select **Create**.
If the profile will be stored in a new Standard, Catalog or Shape name, make sure these are created before

Key in the name for the custom profile in the command line

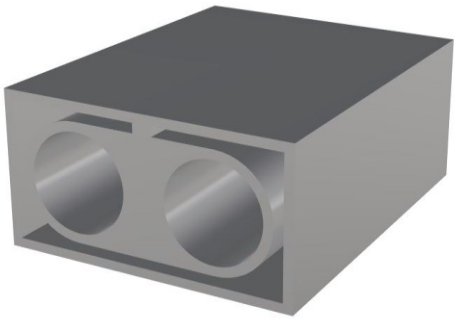
Select the outer profile geometry

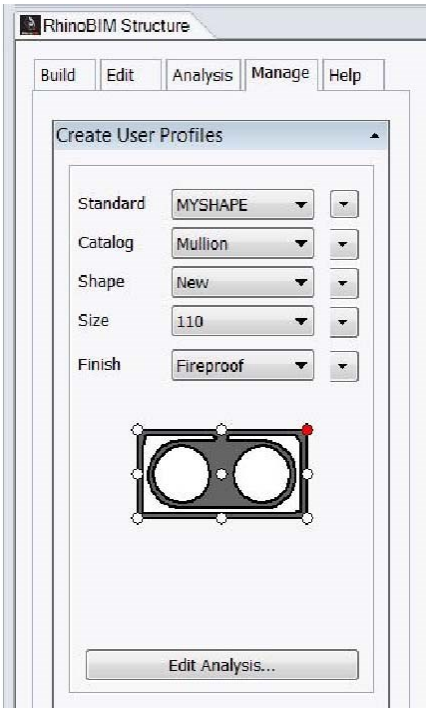
Press **Spacebar** or **Enter key**

Select the inner profile geometry if it applies

Press **Spacebar** or **Enter key**

If you want to add analysis parameters type or select Yes or No





o delete existing items you must delete lower items first.

Import
Export
Libraries

User created library files can be exported and imported to coordinate multiple users on a project.

Translate

BIM Reports

BIM Reports generates a listing of the structural members selected in the model.

Select structural objects

Select **BIM Report** button

Report information is an excel spreadsheets ready to be saved.

CIS/2

CIS/2 translates out structural members selected in the model into the CIS/2 format.

Select structural members

Select **CIS/2** button under the RhinoBIM **Manage** tab

The translated information is saved in a user specified file

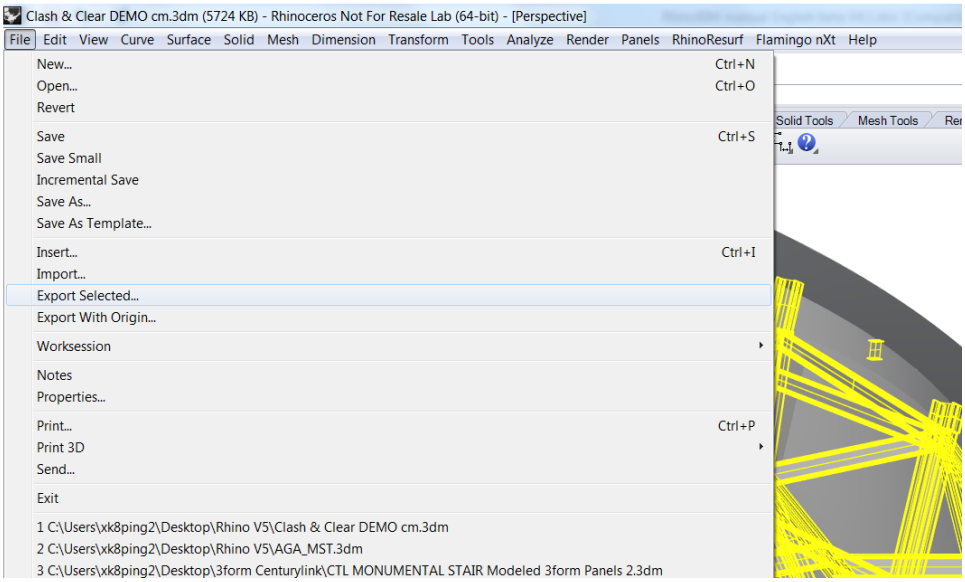
Translation back into Rhino is under development

IFC

IFC translates out structural members selected in the model into the IFC 2X3 format.

Select the structural members

Use the Rhino **File** function and select the option **Export Selected**



In the next menu enter the file name

In the File Type select the IFC file type

Select the Save button in the menu

Convert to NURBS

Convert to NURBS function converts selected structural members into joined NURBS surface entities. It allows users to save in a Rhino 3dm format or translate to other formats that support NURBS such as STEP, DWG or IGES.

Select structural members

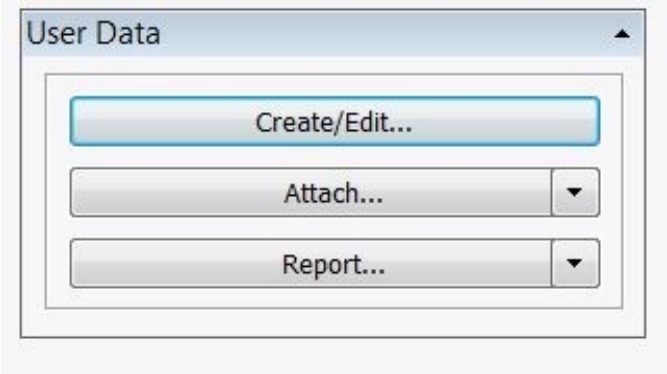
Select **Convert to NURBS** button under the RhinoBIM Manage tab

In Save As window select file format type

Enter a file name

User Data

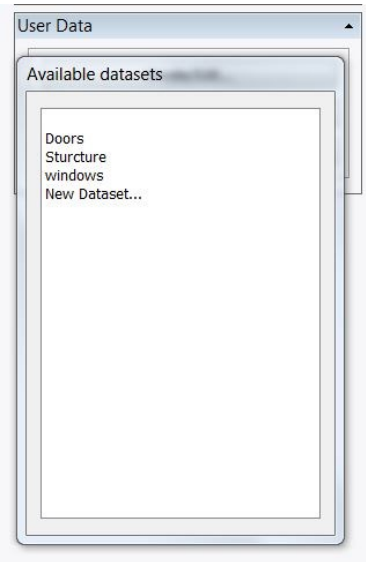
User Data function allows for the creation of a database of any information a project requires. The information can then be attached to any Rhino geometry in a model. The function is found under the **Manage** tab.



Building a User Data Base

Select **Create/Edit** button

In the pop up window double click on **New Dataset**

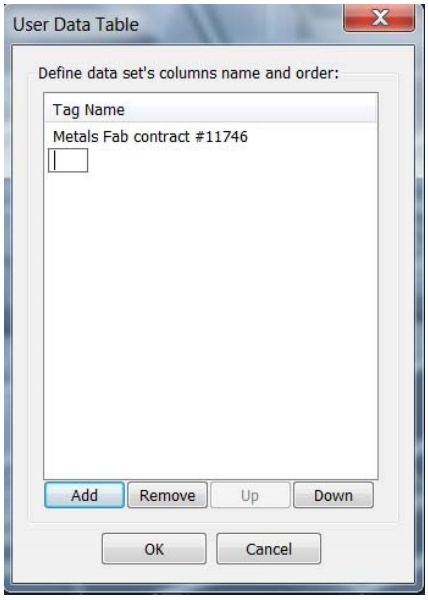


In the pop up window key in the **Data set name**

Select **OK** or press the **Return Key**

In the pop up window select the **Add** button to add information in the data set that will listed under the data set name.

The **Remove** button removes column names



To attach information to Rhino entities

Select **Attach** button

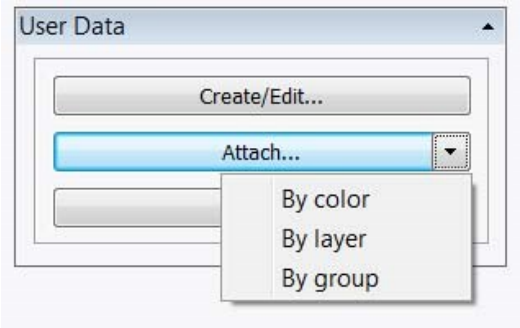
Select any Rhino entity use the Rhino Edit Select

Or

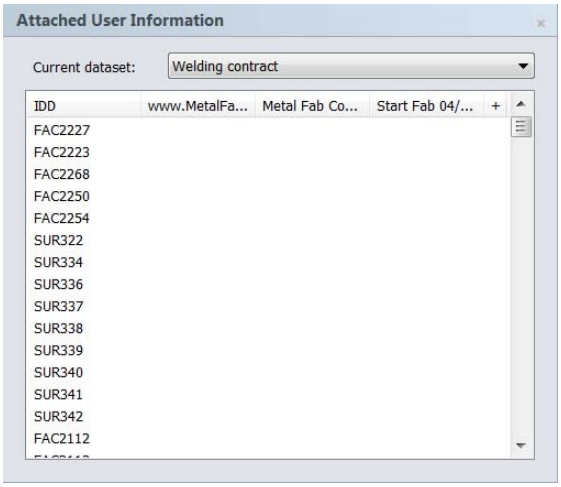
Select the arrow at the far right of the **Attach** Button

Select by **Color, Layer** or **Group**

Select a Rhino entity in that **Color, Layer** or **Group**



A pop up window displays the information and a list of the entities it is attached to



To generate an excel spread sheet report

Select **Report** button

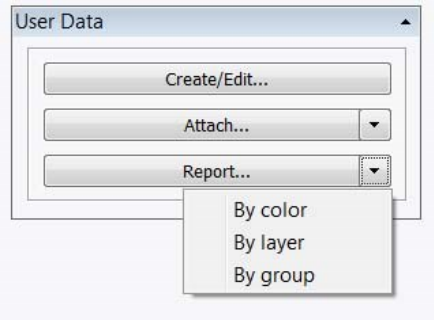
Select any Rhino entity or use the **Rhino / Edit / Select Objects**

Or

Select the arrow at the far right of the **Attach** Button

Select by **Color, Layer** or **Group**

Select a Rhino entity in that **Color, Layer** or **Group**



	A	B	C	D
1	**IDD**	**www.MetalFab.com**	**Metal Fab Contract 11753**	**Start Fab 04/15/2015**
2	STR411			
3	STR412			
4	STR398			
5	STR413			
6	STR414			